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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/873,931	06/04/2001	Robert D. Horning	H16-16009 US	4429

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EXAMINER	
RAO, SHRINIVAS H	

ART UNIT	PAPER NUMBER
2814	

DATE MAILED: 04/06/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)
	09/873,931	HORNING ET AL.
	Examiner	Art Unit
	Steven H. Rao	2814

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *27 July 2004*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *19-36* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☐ Claim(s) *19-36* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *04 June 2001* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Priority

The application as currently filed does not claim priority from any earlier filed Patent Application, therefore currently the earliest available filing date is the U.S. filing date namely June 04, 2001.

EXAMINER'S AMENDMENT

An examiner's amendment to the record appears below. Should the changes and/or additions be unacceptable to applicant, an amendment may be filed as provided by 37 CFR 1.312. To ensure consideration of such an amendment, it MUST be submitted no later than the payment of the issue fee.

Authorization for this examiner's amendment was given in a telephone interview with John S. Munday (22,636) on March 30, 2005 .

Claims 19 and 28 have been amended as follows :

Claim l9.(presently amended) A device produced according to the method of making a silicon micromechanical structure, comprising the steps of forming a lightly doped silicon substrate having a first and second side and having less than 5x1019 cm-3 boron therein;

placing a p + layer on the first side of said substrate, said p+l- having a boron

content of greater than 7x1019 cm-3 and a germanium content of no more than about 1x1021 cm-3'to provide a strain compensasted p+ layer forming a mask on the second side for etching a predetermined pattern; etching said second side to said p+

layer; and depositing an insulator on said p+ layer and fabricating an electronic component on said insulator.

28. A device produced according to the method of making a silicon micromechanical structure, comprising the steps of: forming a lightly doped silicon substrate having a first and second side and having less than 5x1019 cm-3 boron therein,' placing a p+ layer on the first side of said substrate, said p+- having a boron content of greater than 7x1019 cm-3 and a germanium content of no more than about 1x1021 cm-3' forming a lightly doped layer on said p1' layer to form a buried p+ layer to produce a strain compensated p+ layer forming a mask on the second side for etching a predetermined pattern; etching said second side to said buried p+ layer', and depositing an insulator on said lightly doped layer and fabricating an electronic component on said insulator.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 19-21 and 28-30 are rejected under 35 U.S.C. 103 as being obvious over Wu et al. (U.S. Patent No. 6,521,041, herein after Wu) as previously applied and further in view of Radamson et al. (Electrical characterization and strain compensation effect

and thermal stability of B-doped Si-Ge/Si hetero structures by H. H. Radamson, O. Nur et al. , Linkoping University , Sweden)

It is noted that claims 19 and 28 are presently in product by process format and must be rewritten in independent form to include all the limitations of the corresponding process claims 1 and 10.

With respect to claim 19, Wu describes a device produced according to the method of claim 1. (Wu lightly doped silicon substrate having first and second side and less than 5 x 10^{19} cm^{-3} boron therein – Wu fig. 1D col. 4 line 29; placing a p+ layer on the first side of the substrate having a boron content of greater than 7x 10^{19} cm^{-3} and a germanium content of 1x 10^{21} cm^{-3} (Wu – boron -abstract line14, Germanium col. 10lines 20-25;

Wu does not specifically describe the presently newly added limitation to produce a strain compensated p+ layer .

However Radamson article describes in page 1397 left hand column 1st full paragraph) that that Ge concentration results in strain compensated layer , to produce devices having both low hall and drift mobilities.

Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to include Radamson's description of low germanium content (preferably range of $0 < x < 0.23$) in Wu's device. The motivation to make the above combination is to produce devices having both low hall and drift mobilities. (Radamson abstract last two lines).

The remaining limitations of claim 19 are:

Forming a mask on the second side to etch a predetermined pattern- Wu col. 8 lines 5-10, 30-40; etched second side of the p + layer – Wu col. 8 lines 6–7,35-40, lines ; an insulator on said p+ layer and fabricating an electronic component on said insulator (insulator fig. 10 in the embodiment when layer 1008 is bulk insulating material, col.13 lines 50-54 – col. 14 lines 7-10 and electronic components – col. 7 lines 50-60).

With respect to claim 20, Wu describes the device of claim 19, wherein said boron content is greater than 1x 10^{20} cm3 (Wu col. 4 line 51)and the germanium content is from about 0.5 X 10^{21} cm-3 to about 2.0 X 10^{21} $CM^{-3.}$ (Wu col. 10 line 20-25) .

With respect to claim 21 Wu describes the device of claim 19, wherein said micromechanical. structure is a pressure sensor. (Wu col. 7 lines 54,58-59).

With respect to claim 28, Wu describes a device produced according to the method of claim 10. Claim 28 repeats the elements of claim 19 and recites an buried p+ layer below the lightly doped layer (WU figure 1D).

With respect to claim 29, Wu describes the device of claim 28, wherein said boron content is greater than 1x 10^{20} cm3 (Wu col. 4 line 51)and the germanium content is from about 0.5 X 10^{21} cm-3 to about 2.0 X 10^{21} $CM^{-3.}$ (Wu col. 10 line 20-25).

With respect to claim 30, Wu describes the device of claim 28, wherein said micromechanical structure is a pressure sensor. (Wu col. 7 lines 54,58-59).

B. Claims 22, 27 and 31 are rejected under 35 U.S.C. 103(a) as being unpatentable over Wu et al. (U.S. Patent No. 6,521,041, herein after Wu) in view of Radamson et al. (Electrical characterization and strain compensation effect and thermal stability of B-doped Si-Ge/Si hetero structures by H. H. Radamson, O. Nur et al. , Linkoping University , Sweden) as applied to claims 19-21 above and further in view of Stemme et al. (U.S. Patent No. 6,546,804, herein after Stemme).

With respect to claims 22 and 31 Wu describes the device of claim 21.

Wu does not specifically describe the electronic component is selected from the group consisting of dielectrically isolated piezoresistors and resonant microbeams.

However Stemme in col. 4 lines 11-12 and col. 7 lines 14 describes electronic component is selected from the group consisting of dielectrically isolated piezoresistors and resonant microbeams to form ultraminiaturized sensors having high sensitivty in a cost effective manner .

Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to specify Stemme's dielectrically isolated piezoresistors and resonant microbeams for the unspecified sensors of Wu in Wu's device to form ultraminiaturized sensors having high sensitivty in a cost effective manner . (Stemme col. 2 lines 38-48).

With respect to claim 27 The device of claim 19, wherein said micromechanical. structure includes a dielectrically isolated piezoresistor formed on a top surface of a first wafer, a second wafer is bonded to said first wafer, and said second wafer forms a single crystal piezoresistor. (Stemme fig. 16 and col. 2 lines 20-36 Wu figure 10).

C. Claims 23 to 26 , 32 to 36 are rejected under 35 U.S.C. 103(a) as being unpatentable over Wu et al. (U.S. Patent No. 6,521,041, herein after Wu) in view of Radamson et al. (Electrical characterization and strain compensation effect and thermal stability of B-doped Si-Ge/Si hetero structures by H. H. Radamson, O. Nur et al. , Linkoping University , Sweden) and Stemme et al. (U.S. Patent No. 6,546,804, herein after Stemme) as applied to claims above and further in view of Nilsson et al. (U.S. Patent No. 6,252,335, herein after Nilsson).

With respect to claims 23 and 32 Wu describes the device of claim 19. Wu and Stemme do not specifically describe the micromechanical structure is a cantilevered accelerometer.

However Nilsson in its abstract line 1, etc. describes a cantilevered beam accelerometer to obtain a beam sensor that is small, very sensitive but with minimal orthogonal sensitivity and is highly resistant to shocks.

Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to include Nilsson's cantilevered accelerometer as the beam sensor described by Wu and Stemme in their (WU and Stemme's) devices to obtain a beam sensor that is small, very sensitive but with minimal orthogonal sensitivity and is highly resistant to shocks. (Nilsson col. 1 lines 45 to 52).

With respect to claims 24 and 33 Wu, Stemme and Nilsson describe the device of claim 23, wherein said electronic component is selected from the group consisting of dielectrically isolated piezoresistors and resonant microbeams. (Stemme in col. 4 lines 11-12 and col. 7 lines 14).

With respect to claims 25 and 34 Wu, Stemme and Nilsson describe the device of claim 19, wherein said micromechanical structure is a dual web biplane accelerometer formed by forming a said p+ layer on both sides of said substrate, forming a proof mask and flexure etching on both sides of said layer until said etching reaches said p+ layers. (Nilsson figure 1, figure 6, col. 4 lines 33 to 44).

With respect to claims 26 and 35 Wu, Stemme and Nilsson the device of claim 25, wherein said electronic component is selected from the group consisting of dielectrically isolated piezoresistors and resonant microbeams. (Stemme in col. 4 lines 11-12 and col. 7 lines 14).

With respect to claims 31 and 35 Wu, Stemme and Nilsson describe the device of claim 30, wherein said electronic component is selected from the group consisting of dielectrically isolated piezoresistors and resonant microbeams.

With respect to claims 32 and 36 Wu, Stemme and Nilsson describe the device of claim 28, wherein said micromechanical structure is a cantilevered accelerometer.

Response to Arguments

Applicant's arguments with respect to claims 19 have been considered but are moot in view of the new ground(s) of rejection.

Applicants' Applicants' first contention that the Wu reference can be distinguished over the presently recited claims 19 and 28 and dependent claims 20 and 29 (different Ge content range- see rejection above) because the independent claims 19 and 28 recite their silicon doped with about 1 OA (i.e. recite ' a germanium content of about 1 x 10 21-3 " cm)is not persuasive for the following reasons :

(a) Applicants' arguments are not comunsurate in scope with the presently

recited claims because the claims recite, "' i tent of about 1 x 10 21 cm -

a germanum content 3 " whîch recitation does not exclude any range over the afleged 1 %.(e.g 1-20 % Ge).

If Applicants' want to distinguish on the above mentioned basis then the claims

may recite e.g. " no more than about 1 %" or simlar language positively reciting the 1 % limitation and which will exclude the higher percentages of germanium from the scope of the claims.

(b) Assuming arguendo that Applicants' have recited " no more than about I %",

Wu contrary to Applicants' contention describes its structure as including plurarity of graded relaxed layers (Col. 8 lines 45-46) wherein the device has SiGe wherein the Ge content is graded from the bottom surface up to the top surface, including up to zero percent at the top surface (as also seen from fig. IA, D and figure 5, Abstract lines 7-8, etc.).

(c) Wu teachings should not be limited to its upper end (18%) of the range of

the Ge content in the SiGe layers because Wu teaches SiGe layers with "germanium content less than approximately 18" (col.46 lines 63-65) which range includes all percentages between O (lower end) to 18 (upper end) percent, which percentage range overlaps and includes Applicants' about 1 DA . Further Wu in col. 7 lines 18 describes (5 to 10%) and line 19 describes (5 to 15%) and Applicants' claims 20 and 29 describe about 2 %.

(d) Assuming arguendo that Applicants' have recited " no more than about I %", the Specification as originally 5led contains no disclosure of either the critical nature of the claimed range (about 1 % of Ge) nor any unexpected results arising therefrom. Where patentability is said to be based upon particular range or another value recited in the claim, the Applicant must show the chosen ranges are critical. In re Woodruff, 919 F. 2d 1575, 16 USPQ2d 1934, 1936 (Fed. Cir. 1990).

Any inquiry concerning this communication or earlier communication from the examiner should be directed to Steven H. Rao whose telephone number is (571) 272 – 1718 The examiner can normally be reached on Monday- Friday from approximately 7:00 a.m. to 5:30 p.m.

Any inquiry of a general nature or relating to the status of this application should be directed to the Group receptionist whose telephone number is (703) 308-0956. The Group facsimile number is (703) 308-7724.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Steven H. Rao

March 31, 2005

Patent Examiner